

REMARKS

Applicants amend claims 1, 7, 8, 15, 46, 50, 67, 77, 82 and add claims 92-96 such that claims 1-96 are pending in the present application. Applicants respectfully request allowance of all the pending claims.

Specification Objections

The Examiner objects to the Abstract of the disclosure because that Examiner states that it contains claim and legal terminology such as “according to claim 39,” “therein,” and “wherein said.” Applicants respectfully submit that the Abstract filed in the Application does not include this identified language. However, Applicants speculate that the Examiner intends to object to the language “according to the present invention.” Accordingly, Applicants cancel this language from the Abstract. Applicants respectfully request the Examiner to withdraw the objection to the Abstract.

Claim Rejections – 35 U.S.C. §102

The Examiner rejects claims 1, 2, 4-7, 10-89 under 35 U.S.C. §102(e) as being anticipated by United States Patent No. 5,947,075 (“Ryu”).

RYU PATENT

Ryu discloses an engine E including an engine body 1 having a cylinder block 6 and a crankcase 7 connected to a lower end face of the cylinder block 6 (Fig. 3). Upper and lower crankcase halves 7a, 7b combine to define a flywheel back plate. The engine E includes a shroud 69 mounted to the engine body 1.

As shown in Fig. 25, the engine E includes a crank chamber 132a, an oil reservoir 132b, and a partition wall 134 dividing the crank chamber 132a and the oil reservoir 132b. The oil reservoir 132b is in fluid flow communication with the crank chamber 132a through opening 133. The oil reservoir 132b includes first and second portions on opposite sides of the crank chamber 132a. When the engine E is in the inverted position, there is no fluid communication between the first and second portions of the oil reservoir 132b. As illustrated in Fig. 19, a cylinder side wall extends into the crank chamber 132a and abuts directly against the partition wall 134 such that no gap exists between the cylinder side wall and the partition wall 134. In the

embodiment illustrated in Fig. 11, a gap exists between the cylinder side wall and a dividing wall between the crankshaft chamber 23 and the valve operating chamber 24. The embodiment of Fig. 11 does not include a partition wall dividing the crankshaft chamber 23 and an oil reservoir.

As shown in Fig. 2, the engine includes a crankshaft 13 supported for rotation at both ends. The crankshaft 13 includes a counterweight 13a (Fig. 5). As best shown in Fig. 2, the crankshaft 13 is partially supported for rotation within the crank chamber 23 by a bearing 17 and is connected with a piston 8 to convert linear movement of the piston 8 into rotation of the crankshaft 13. The engine E also includes a cam shaft 34 and a cam 35 supported on the cam shaft 34. The cam shaft 34 is oriented parallel to the crankshaft 13 and is rotatable in response to rotation of the crankshaft 13 to actuate valves 29, 30 of the engine E (Fig. 5).

With reference to Fig. 5, the engine E includes intake and exhaust ports 27, 28 that are circular in a cross-section taken perpendicular to the longitudinal axis of each respective port 27, 28. As shown in Fig. 16, the engine E includes a recoil-type starter 143 capable of rotating the crankshaft 108.

CLAIM 1

Independent claim 1 recites a four-stroke internal combustion engine including an engine housing, a cylinder head, intake and exhaust valves, a crank chamber, an oil reservoir, an agitator, and a divider. The engine housing includes a crankcase and a cylinder. The cylinder head at least partially defines a combustion chamber and is disposed adjacent to the cylinder. The intake and exhaust valves are disposed within the engine housing, and the crank chamber and oil reservoir are disposed within the crankcase. The oil reservoir is in fluid flow communication with the crank chamber. The divider is disposed within the crankcase and at least partially divides the crank chamber and the oil reservoir. The oil reservoir includes first and second portions on opposite sides of the crank chamber and a path fluidly connecting the first and second portions. The path allows lubricant from the oil reservoir to flow around a substantial portion of the divider and to equalize the amount of lubricant in the first and second portions when the engine is inverted.

Claim 1 has been amended to recite a path that fluidly connects first and second portions of the oil chamber to equalize the lubricant level in the first and second portions when the engine is inverted. This feature is found in the second embodiment of the applicant's invention, and is

best shown in Fig. 28 and described in the application at page 29, lines 13 through 21.

Ryu and the other art of record do not teach or suggest a path that fluidly connects first and second portions of an oil chamber to equalize the lubricant levels in the first and second portions when the engine is inverted. Instead, Ryu discloses fluidly isolating the first and second portions of the crank chamber 132b when the engine E is inverted (Fig. 25).

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 1. Accordingly, independent claim 1 is allowable. Claims 2-38 and 43 depend from allowable independent claim 1 and are allowable for the same reasons.

CLAIM 39

Independent claim 39 recites a four-stroke internal combustion engine adapted for assembly on an assembly fixture. The engine includes an engine housing and a shroud that at least partially surrounds the engine housing. The engine housing includes an integrally formed crankcase, cylinder and flywheel back plate. The flywheel back plate includes a mounting boss on one side such that a pin of the assembly fixture is received by the mounting boss. The shroud includes a slot that surrounds the pin of the assembly fixture when the shroud is positioned around the engine. The slot allows the pin to be removed from the mounting boss after the shroud is attached to the engine. The engine is substantially completely assembled while the engine housing is mounted to the assembly fixture.

Ryu and the other art of record do not teach or suggest an integrally formed crankcase, cylinder and flywheel back plate. Instead, Ryu discloses a cylinder block 6 that is non-integral with a crankcase 7 and that is connected to the crankcase 7 by stud bolts 19 (Fig. 3).

Also, Ryu and the other art of record do not teach or suggest a flywheel back plate that includes a mounting boss on one side such that a pin of an assembly fixture can be received by the mounting boss. Ryu does not teach or suggest a mounting boss on the flywheel back plate nor does it teach or suggest any method of using an assembly fixture whatsoever.

In addition, Ryu and the other art of record do not teach or suggest a shroud that includes a slot that surrounds a pin of an assembly fixture when the shroud is positioned around the engine. Ryu does not teach or suggest a slot in the shroud 69 nor does it teach or suggest any method of using an assembly fixture whatsoever.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter

defined by independent claim 39. Accordingly, independent claim 39 is allowable. Claim 45 depends from allowable independent claim 39 and is allowable for the same reasons.

CLAIM 40

Independent claim 40 recites a four-stroke internal combustion engine. The engine includes an engine housing, a cantilevered crankshaft, a piston, a connecting rod, and a wrist pin. The engine housing includes an oversized wrist pin boss that is machinable to include at least a first aperture in one location and a second aperture in another location. The cantilevered crankshaft is disposed within the engine housing and the piston is reciprocally operable within the engine housing. The piston includes an aperture and the connecting rod includes opposite ends. One end of the connecting rod is pivotally attached to the crankshaft and the other end of the connecting rod is pivotally connected to the piston. The wrist pin is passable through the first aperture in the boss, into the aperture of the piston, and into one end of the connecting rod to pivotally connect the connecting rod to the piston to provide a first throw of the engine. The wrist pin is also passable through the second aperture of the boss, into the aperture of the piston, and into one end of the connecting rod to pivotally connect the connecting rod to the piston to provide a second throw of the engine.

Ryu and the other art of record do not teach or suggest an oversized wrist pin boss that is machinable to include at least a first aperture in one location and a second aperture in another location. Further Ryu does not teach or suggest a wrist pin that is passable through the first aperture in the boss and into an aperture of a piston to pivotally connect the connecting rod to the piston to provide a first throw of the engine. Additionally, Ryu and the other art of record do not teach or suggest a wrist pin that is passable through the second aperture of the boss into the aperture of the piston to pivotally connect the connecting rod to the piston to provide a second throw of the engine. Ryu does not teach or suggest any wrist pin boss nor does Ryu teach or suggest any method whatsoever of passing a wrist pin through an aperture in a wrist pin boss to assemble the piston and connecting rod.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 40. Accordingly, independent claim 40 is allowable. Claim 44 depends from allowable independent claim 40 and is allowable for the same reasons.

CLAIM 41

Independent claim 41 recites a four-stroke internal combustion engine including a crankshaft, a blower housing, a starter assembly, and an annular ring. The blower housing includes a hub that includes an extension and is adapted to fit over the crankshaft. The starter assembly is surrounded by the blower housing, positioned onto the hub extension, and adapted to cooperate with the crankshaft to start the engine. The annular ring is positioned over the extension to prevent axial movement of the starter assembly.

Ryu and the other art of record do not teach or suggest an annular ring positioned over an extension of a blower housing to prevent axial movement of a starter assembly positioned on the hub extension. Rather, Ryu discloses a starter assembly 143 that is positioned on a hub extension of a housing and that is allowed to move axially along the hub extension (Fig. 16). Ryu does not teach or suggest any ring whatsoever over the hub extension to restrict the starting assembly 143 from moving axially.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 41. Accordingly, independent claim 41 is allowable.

CLAIM 42

Independent claim 42 recites a method of assembling a four-stroke internal combustion engine. The method includes providing an engine housing having an integrally formed crankcase, cylinder, and flywheel back plate, providing a mounting boss on the back plate, mounting the engine to an assembly fixture by positioning a pin on the fixture into the mounting boss, placing a shroud around the engine housing while the engine remains mounted to the fixture, and attaching the shroud to the engine housing while the engine remains mounted to the assembly fixture.

Ryu and the other art of record do not teach or suggest an integrally formed crankcase, cylinder and flywheel back plate. Instead, Ryu discloses a cylinder block 6 that is non-integral with a crankcase 7 and that is connected to the crankcase 7 by stud bolts 19 (Fig. 3).

Also, Ryu and the other art of record do not teach or suggest a flywheel back plate that includes a mounting boss on one side such that a pin of an assembly fixture can be received by the mounting boss. Ryu does not teach or suggest a mounting boss on the flywheel back plate nor does it teach or suggest any method of using an assembly fixture whatsoever.

In addition, Ryu and the other art of record do not teach or suggest a shroud that includes a slot that surrounds a pin of an assembly fixture when the shroud is positioned around the engine. Ryu does not teach or suggest a slot in the shroud 69 nor does it teach or suggest any method of using an assembly fixture whatsoever.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 42. Accordingly, independent claim 42 is allowable. Claims 43-45 depend from allowable independent claim 42 and are allowable for the same reasons.

CLAIM 46

Independent claim 46 recites a four-stroke internal combustion engine including an engine housing, a crank chamber, a crankshaft, a piston, an oil reservoir, an arcuate divider, and extending wall. The engine housing includes a crankcase and a cylinder. The crank chamber is disposed within the crankcase and the crankshaft is supported for rotation within the crank chamber. The piston is operably interconnected with the crankshaft for reciprocation within the cylinder in response to rotation of the crankshaft. The oil reservoir is disposed within the crankcase and is in fluid flow communication with the crank chamber. The arcuate divider at least partially separates the crank chamber from the oil reservoir. The depending wall extends at least partially into the crank chamber to define a lubricant receiving space between the arcuate divider and the depending wall.

Ryu and the other art of record do not teach or suggest a depending wall that extends at least partially into the crank chamber to define a lubricant receiving space between the arcuate divider and the depending wall. Instead, Ryu discloses a cylinder side wall that extends into the crank chamber 132a and abuts directly against the partition wall such that no gap exists between the cylinder side wall and the partition wall 134 (Fig. 19). In the embodiment shown in Fig. 11, Ryu discloses a gap adjacent the cylinder side wall and a dividing wall, however the dividing wall is straight and instead of dividing the crankshaft chamber and an oil reservoir it separates the crankshaft chamber 23 and the valve operating chamber 24.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 46. Accordingly, independent claim 46 is allowable. Claims 47-65 depend from allowable independent claim 46 and are allowable for the same reasons.

CLAIM 66

Independent claim 66 recites a four-stroke internal combustion engine including an engine housing, a crankshaft, a wrist pin boss, a piston, a connecting rod, and a wrist pin. The engine housing includes a crankcase and a cylinder and the crankshaft is supported for rotation within the crank chamber. The wrist pin boss is on the engine housing and is large enough to permit an access hole to be machined at one of at least two locations into the wrist pin boss. The piston is reciprocally operable within the cylinder and includes an aperture. The access hole and aperture are alignable during assembly of the engine. The connecting rod includes one end pivotally attached to the crankshaft and another end pivotally connected to the piston. The wrist pin is insertable through the access hole and into the aperture in the piston to pivotally connect the connecting rod to the piston. The location of the access hole in the wrist pin boss is selected to accommodate a desired connecting rod length.

Ryu and the other art of record do not teach or suggest an oversized wrist pin boss that is machinable to include at least a first aperture in one location and a second aperture in another location. Further Ryu does not teach or suggest a wrist pin that is passable through the first aperture in the boss and into an aperture of a piston to pivotally connect the connecting rod to the piston to provide a first throw of the engine. Additionally, Ryu and the other art of record do not teach or suggest a wrist pin that is passable through the second aperture of the boss into the aperture of the piston to pivotally connect the connecting rod to the piston to provide a second throw of the engine. Ryu does not teach or suggest any wrist pin boss nor does Ryu teach or suggest any method whatsoever of passing a wrist pin through an aperture in a wrist pin boss to assemble the piston and connecting rod.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 66. Accordingly, independent claim 66 is allowable.

CLAIM 67

Independent claim 67 recites a four-stroke engine capable of being operated in a tipped position. The engine includes an engine housing, a combustion chamber, intake and exhaust valves, a piston, a crankshaft, and a cam shaft. The engine housing includes a crankcase and a cylinder. The crankcase includes a reservoir adapted to contain a lubricant. The combustion chamber is at least partially defined by the cylinder. The intake and exhaust valves communicate

with the combustion chamber. The piston reciprocates within the cylinder. The crankshaft is supported for rotation within the crank chamber by a bearing and connected with the piston to convert linear movement of the piston into rotation of the crankshaft. The cam shaft is oriented normal to the crankshaft and is rotatable in response to rotation of the crankshaft to actuate the valves. The engine also includes a crank chamber disposed within the crankcase. The cam shaft includes an axial passageway and a radial aperture that communicate between the crank chamber and the passageway. The cam shaft receives lubricant from the reservoir through the bearing.

Ryu does not teach or suggest a cam shaft oriented normal to the crankshaft. Rather, Ryu discloses a cam shaft 34 that is oriented parallel to the crankshaft 13 (Fig. 2).

Also, Ryu does not teach or suggest a cam shaft including an axial passageway and a radial aperture that communicates with a crank chamber and the passageway. Ryu does not teach or suggest any aperture or passageway whatsoever through the cam shaft 34.

In addition, Ryu and the other art of record do not teach or suggest a cam shaft that receives lubricant from a reservoir through the bearing. Ryu does not teach or suggest transferring any lubricant whatsoever through bearing 17.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 67. Accordingly, independent claim 67 is allowable. Claims 92-95 depend from allowable independent claim 67 and are allowable for the same reasons.

CLAIM 68

Independent claim 68 recites a four-stroke internal combustion engine including an engine housing, a crank chamber, and a cantilevered crankshaft. The engine housing includes a crankcase and a cylinder. The crank chamber is disposed within the crankcase. The cantilevered crankshaft is supported for rotation within the crank chamber and includes a counterweight having a locating hole to accommodate a tool for proper insertion of the crankshaft into the crank chamber.

Ryu does not teach or suggest cantilevered crankshaft supported for rotation within the crank chamber. Also, Ryu and the other art of record do not teach or suggest a counterweight having a locating hole to accommodate a tool for proper insertion of the crankshaft into the crank chamber. Instead, Ryu discloses a crankshaft 13 supported for rotation at both ends and counterweights 13a that do not include any locating holes whatsoever (Figs. 2 and 5).

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 68. Accordingly, independent claim 68 is allowable. Claims 69 and 96 depend from allowable independent claim 68 and are allowable for the same reasons.

CLAIM 70

Independent claim 70 recites a four-stroke internal combustion engine including an engine housing, a crank chamber, a crankshaft, a piston, a shroud, and a fuel tank. The engine housing includes a crankcase and a cylinder. The crank chamber is disposed within the crankcase and the crankshaft is supported for rotation within the crank chamber. The piston is operably interconnected with the crankshaft for reciprocation within the cylinder in response to rotation of the crankshaft. The shroud at least partially surrounds the engine housing and includes a pair of opposed channels. The fuel tank includes opposed outwardly-extending shoulders that are received by the respective channels of the shroud.

Ryu discloses in Fig. 16 a fuel tank 105 that is supported on one side by a channel, however, we do not believe that the channel is part of the shroud 153 as recited in claim 70. Rather, Applicants respectfully submit that the depending slotted portion is a part of the right case half 106b. Applicants submit that because the depending slotted portion is not cross-hatched to match either the shroud 153 or the right case half 106b, the drawings must be interpreted in light of the detailed description. Ryu describes in col. 10, lines 17-18 that the fuel tank 105 is mounted to a lower surface of the engine body 101. In addition, the patent describes in col. 10, lines 24-26 that the engine body 101 includes a crankcase 106 comprised of a pair of left and right case halves 106a, 106b coupled to each other by bolts. Nowhere in Ryu does it describe the fuel tank 105 as being mounted to the shroud 153. Therefore, based on the description of Ryu, it is clear that the fuel tank 105 is mounted to a lower surface of the right case half 106b of the engine body 101.

In addition, this interpretation is analogous to the description of the assembly of the first embodiment illustrated in Figs. 1-10. Ryu describes in col. 4, lines 18-19 that the fuel tank 5 is mounted to a lower surface of the engine body 1. Also, the patent describes in col. 4, lines 26-33 that the engine body 1 includes a crankcase 7 comprised of a pair of upper and lower case halves 7a, 7b coupled to each other by bolts. As plainly shown in Figs. 2-4, the fuel tank 5 is indeed mounted to the lower case halve 7b of the engine body 1 as described in the specification.

Therefore, it stands to reason that the description “mounted to a lower surface of the engine body” should be consistently interpreted for the embodiment illustrated in Figs. 1-10 and in Figs. 15-25.

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 70. Accordingly, independent claim 70 is allowable. Claims 71-73 depend from allowable independent claim 70 and are allowable for the same reasons.

CLAIM 74

Independent claim 74 recites a four-stroke internal combustion engine including an engine housing, a flywheel, a crank chamber, a crankshaft, and a piston. The engine housing includes a crankcase, a cylinder, and a back plate. The flywheel is adjacent to the back plate, the crank chamber is disposed within the crankcase, and the crankshaft is supported for rotation within the crank chamber. The piston is operably interconnected with the crankshaft for reciprocation within the cylinder in response to rotation of the crankshaft. The crankcase, cylinder, and back plate are cast as a single component.

Ryu and the other art of record do not teach or suggest an integrally formed crankcase, cylinder and flywheel back plate. Instead, Ryu discloses a cylinder block 6 that is non-integral with crankcase 7 and that is connected to the crankcase 7 by stud bolts 19 (Fig. 3).

Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 74. Accordingly, independent claim 74 is allowable. Claims 75-76 depend from allowable independent claim 74 and are allowable for the same reasons.

CLAIM 77

Independent claim 77 recites an L-head, internal combustion engine including an engine housing, intake and exhaust valves, a crank chamber, a crankshaft, and a piston. The engine housing includes a crankcase and a cylinder. The cylinder includes intake and exhaust ports on opposite sides of the engine housing. The intake and exhaust ports are elliptical in a cross-section taken perpendicular to the longitudinal axis of each respective port. The intake and exhaust valves are in communication with the intake and exhaust ports, respectively. The crank chamber is disposed within the crankcase, the crankshaft is supported for rotation within the crank chamber, and the piston is operably interconnected with the crankshaft for reciprocation

within the cylinder in response to rotation of the crankshaft.

Ryu and the other art of record do not teach or suggest an L-head engine including intake and exhaust ports that are elliptical in a cross-section taken perpendicular to the longitudinal axis of each respective port. Instead, Ryu discloses ports 27, 28 having circular cross-sections (Fig. 5).

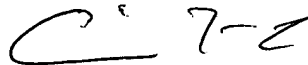
Therefore, Ryu and the other art of record do not teach or suggest the subject matter defined by independent claim 77. Accordingly, independent claim 77 is allowable. Claims 78-89 depend from allowable independent claim 77 and are allowable for the same reasons.

CLAIMS 90 AND 91

Applicants respectfully direct the Examiner's attention to the REQUEST BY APPLICANTS FOR INTERFERENCE WITH APPLICATION UNDER 37 CFR §1.604 filed November 26, 2002. In the REQUEST, Applicants discuss Ryu with respect to claims 90 and 91, which relate to Counts A and B of the requested interference.

The Examiner is invited to contact the undersigned attorney should the Examiner determine that such action would facilitate the prosecution and allowance of the present application.

Respectfully submitted,



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